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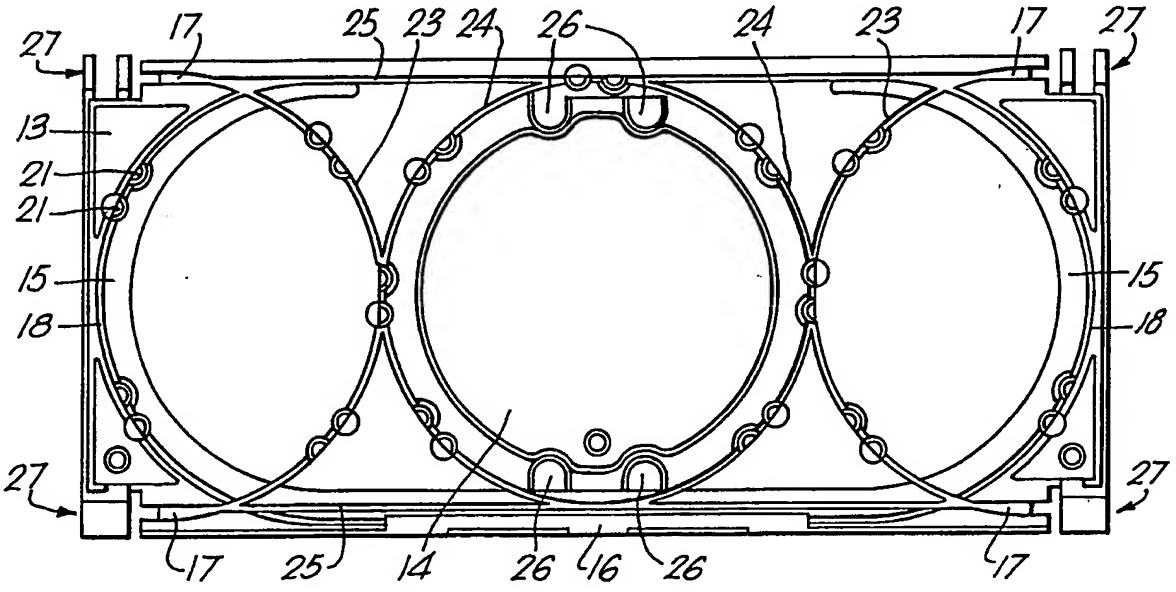
(54) Title: SPLICE ORGANISER



(57) Abstract

A splice organiser comprises a tray having a plurality of formers (14, 15) which control the minimum bend radius of the fibres, a groove for retaining a splice, an enclosure into which coiled fibre loops are introduced and permitted to expand so that they are retained by the resilience of the fibre itself, and a plurality of guide tracks (23, 24, 25) which enable fibres to enter and exit the organiser at any corner of the tray.

* See back of page

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SPLICE ORGANISER

This invention relates to optical fibre distribution and in particular but not exclusively to branched networks for optical telecommunications.

Presently optical fibres are utilised in trunk lines for telecommunications but it is desirable to have optical transmission within other points in a network, such as in branches between an exchange and a subscriber. Elements in such branches need to be reliable under the extremes of ambient temperature and to permit broad spectrum transmission over the range of wavelengths utilised, at present usually 1300 to 1550nm. It is also necessary to ensure that minimum losses occur due to macrobending as optical fibres emerge from branching elements such as couplers.

Our co-pending British application No. 8827348.7 describes an optical fibre distribution arrangement comprising a coupling array and a splice organiser associated with each input and output line of the coupling array, the splice organisers being mounted to a supporting frame and capable of limited relative movement with respect to one another so as to permit access to the splices stored therein. A splice organiser described in the application comprises a tray having a groove for retaining a splice and recesses for confining loops of optical fibre under their own natural resilience. In this splice tray there is only one entry/exit port for the

fibre, which port is located at one corner. However in some instances it would be preferable to be able to have a choice of entry and/or exit port from a number of alternatives. In this case it is desirable that means be provided for the fibre to be routed to the alternative entry/exit ports in such a way that significant optical loss from the fibre due to macrobending is avoided. It is additionally desirable that there are a number of alternative routes to each alternative entry/exit port.

Accordingly the present invention provides a splice organiser comprising a tray having a plurality of formers to define the minimum bend radius of fibres so that significant optical loss from the fibres is avoided, a groove for retaining the splice and at least one recess for confining loops of optical fibre under their own natural resilience, and in which a plurality of guide tracks are provided to enable fibres to enter or exit the organiser at any one of a plurality of ports.

The invention is now described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side view of a preferred embodiment of a splice organiser according to the invention;

Figure 2A shows a detail of one feature of the preferred embodiment;

Figure 2B is a cross-sectional view of the feature shown in Figure 2A; and

Figure 3 shows a further feature of the preferred embodiment.

Figure 1 shows a preferred splice organiser which enables a single splice 16 to be stored on one side of an organiser and fibre to enter or exit the organiser at any one of the four entry/exit ports 26 located at the four

corners of the tray. The organiser comprises a tray 13 having a central raised, substantially circular former 14, and two raised curved end formers 15, the splice 16 being positioned in a splice retaining groove located, as shown, on a long side of the organiser. The fibres enter and pass out of the organiser along any one of separate channels 17 which lead to each of the four corners of the tray. Spare loops of fibre on each side of the splice are stored in the organiser by forming coils of fibre and placing these over the former 14 after passing the first bend after the splice around the outer side of the curved end former 15. Alternative winding patterns around both the end formers or over one end former and the opposite side of the central former may also be used, but several turns should preferably be placed over the central former, and it is preferable to have a single length of fibre close to the splice passing along a separate channel.

The natural resilience of the fibres will cause the coils placed over the central former to expand outwardly into a configuration of varying diameter turns. This procedure is then repeated for the fibre on the other side of the splice. Care has to be taken not to coil the fibres over-tightly in the first instance. In the situation where only the first bend of the fibre after the splice has been passed around the outer side of the curved former, or another channel is provided, the organiser presents a separate track 18 to facilitate non-destructive testing eg via 'Clip-On' (Trade Mark) access technology, see PCT patent application WO 88/07689, should it be necessary for any reason to gain access to the data transmission along the fibre. A route map may be used to determine on which side of the splice the fibre is to be tested, and a suitable tool may be used for lifting the fibre out of the track. This arrangement ensures that

access is gained at a point on the fibre relatively close to the splice, so that if the fibre is in any way damaged by the action of gaining 'Clip-On' access, it is simple to discard the damaged length of fibre, adjust the spare coils, and form a new splice without losing much fibre, thus avoiding the possibly serious mistake of damaging and having to discard a much longer portion of the spare fibre.

Each of the channels 17 is connected to a recessed semicircular track 23 which extends between the two channels 17 at each short end of the organiser. The tracks 23 touch further recessed semicircular tracks 24 at their mutual mid points. Recessed longitudinal tracks 25 extend between the channels 17 disposed along the same long side of the organiser. With this arrangement a fibre in the organiser can be routed to or from any channel 17. For example consider a fibre, wound clockwise as viewed around the central former 14. This fibre may be routed tangentially from the former 14 along the tracks 25 to exit via either the top right or bottom left (as viewed) channel 17. Alternatively the fibre may be guided into one of tracks 24 and then diverted into the intersecting track 23, the fibre undergoing an inflexion, to exit at the bottom right or top left channel 17. Corresponding entry routes apply, and analogous routing for anti-clockwise wound fibre is also possible. The fibres to be spliced are routed through the organiser by laying them in the recessed tracks in a suitable route from the chosen entrance, via the splice 16, to the chosen exit of the organiser; the spare loops of fibre then being coiled up and laid over the central former 14, thus overlying the fibres in the recessed tracks.

Each of the recessed tracks 23, 24 and 25, may have small tabs or clips 21 which retain the fibre in the track. Larger clips 26 may also be provided to retain the spare loops of fibre around the central former 14.

At each corner of the splice organiser the channels 17 are connected to short lengths of tube 19 which fit through holes 27 in the tray 13. These tubes are shown in Figure 2A, which shows a side view of a tube 19, and in Figure 2B, which shows a cross-sectional view of the tube. Each tube is formed with a longitudinal slit 20, and a longitudinal taper of the order of half a degree along at least part of its length, which is provided for ease of removing the tubes from their mould during manufacture. Capillaries for supporting the fibres are then passed through the tube before the tube is pushed into a hole 27 at one corner of the tray. These holes have a slightly smaller diameter than that of the tubes so that the slit 20 is forced to close, and the final circumferences of the tube and the hole match when the tube is pushed in until the tube abuts the end of channel 17.

The tubes 19 consitutute hinge pins, by which means the splice organisers 2 can be pivotally mounted on a supporting frame (not shown). Furthermore, as shown in Figure 3, a hinged or clip-on lid 22 may be provided to cover the organiser, the lid pivoting on the tubes 19, or the organiser may be arranged to co-operatively engage with an adjacent organiser so that the confronting organisers effectively form covers for each other. The reverse side of the organiser preferably has a similar or identical configuration for storing another splice and associated fibre.

A plurality of the preferred splice organisers may be mounted to a supporting frame so as to be capable of limited relative movement with respect to one another and hence permit access to the splices stored therein.

By way of example the dimensions for a preferred embodiment of the splice organiser will now be given. The overall dimensions are approximately 172mm long by 78mm wide, referring to Figure 1, and 8mm deep, referring to Figure 3. The central former 14 is about 60mm in diameter, hence defining a minimum bend radius for primary coated optical fibre which prevents significant optical loss, due to macrobending, from the fibre when it is positioned around the former. The guide tracks 18, 23, 24 and 25 are approximately 1mm wide and vary in depth from about 1mm to about 2mm. The curved tracks 18, 23 and 24 have a radius of curvature of 35mm again chosen to avoid optical loss from the optical fibres due to macrobending.

The splice retaining groove 16 is about 2.4mm wide and about 70mm long to give a snug fit for a conventional heat shrink protected fibre splice.

The tube 19 has an outer diameter of about 1mm and an inner diameter of about 0.5mm. The face of the splice tray shown in Figure 1 is substantially planar to enable adjacent trays to be stacked closely together without wasted space. Typically a tray will have a bow over its whole length of less than about 0.5mm.

The splice tray 13 is preferably moulded from acrylonitrile butadiene styrene (ABS). The tubes 19 are constructed from polyvinylidene fluoride (PVDF) and the lid 22 is formed from a clear polymer such as an acrylic resin.

CLAIMS

1. A splice organiser comprising a tray having a plurality of formers to define the minimum bend radius of fibres so that significant optical loss from the fibres is avoided, a groove for retaining a splice and at least one recess for confining loops of optical fibre under their own natural resilience, and in which a plurality of guide tracks are provided to enable fibres to enter or exit the organiser at any one of a plurality of ports.

2. A splice organiser according to claim 1 wherein the minimum radius of curvature of the guide tracks is such as to avoid significant optical loss in fibres in the guide tracks.

3. A splice organiser according to claim 1 or 2 wherein at least one port is provided at each corner of the tray.

4. A splice organiser according to claim 1, 2 or 3 wherein one loop of the fibre on either side of the splice is passed separately round an outer former in the splice organiser.

5. A splice organiser according to any preceding claim wherein tubes fitted at corners of the tray constitute hinge pins by which the splice organiser can be pivotally mounted to a frame, and the tubes accommodate capillary tubes for conducting fibres into the splice organiser.

6. A splice organiser according to claim 5 wherein the tubes form means whereby a hinged or clip-on lid may be fitted to the splice organiser.

7. An optical fibre distribution arrangement substantially as hereinbefore described with reference to and as illustrated in any one of the accompanying drawings.

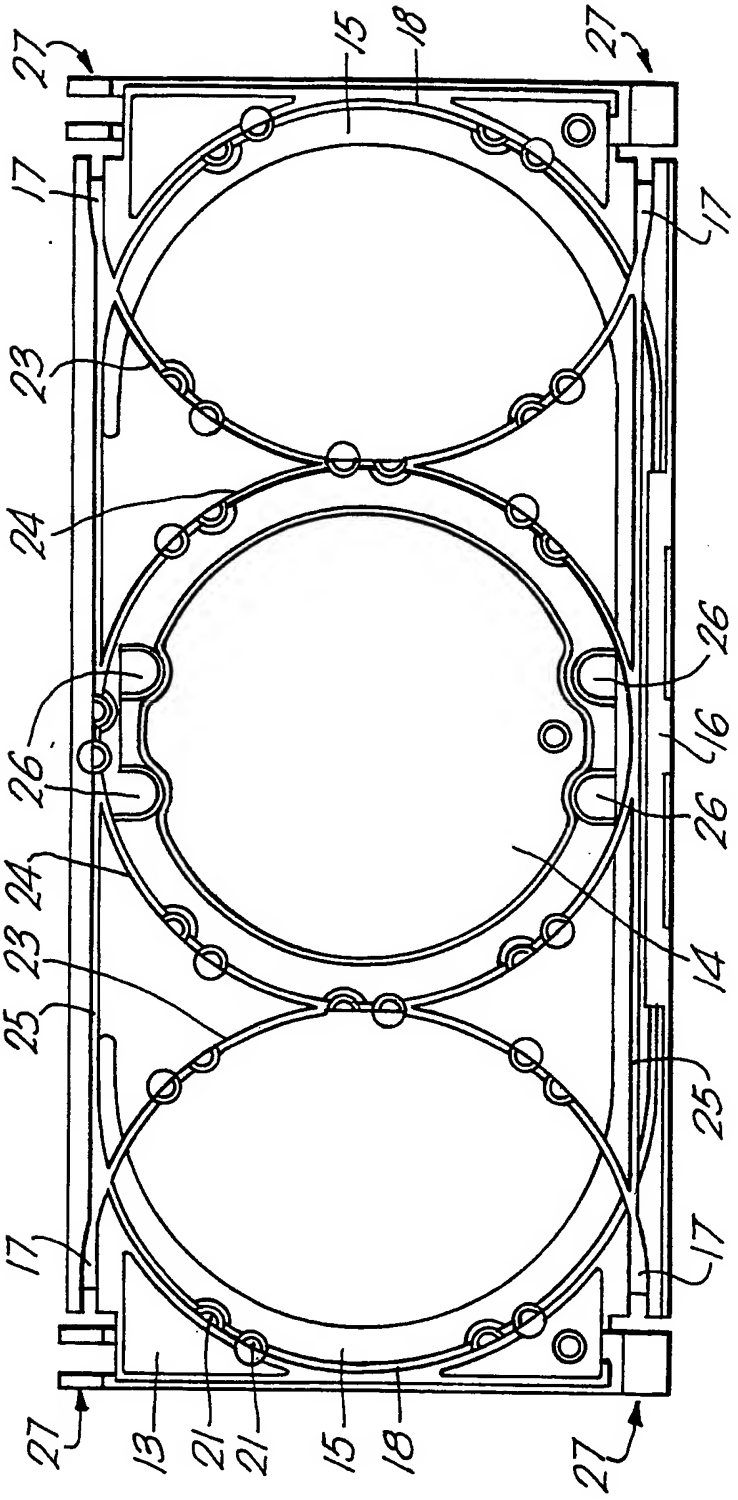


Fig. 1.

Fig.2A.

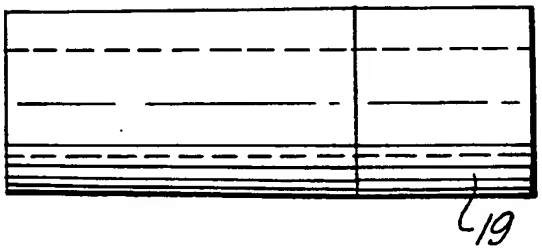


Fig.2A.

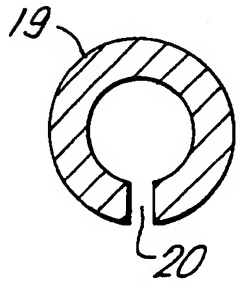
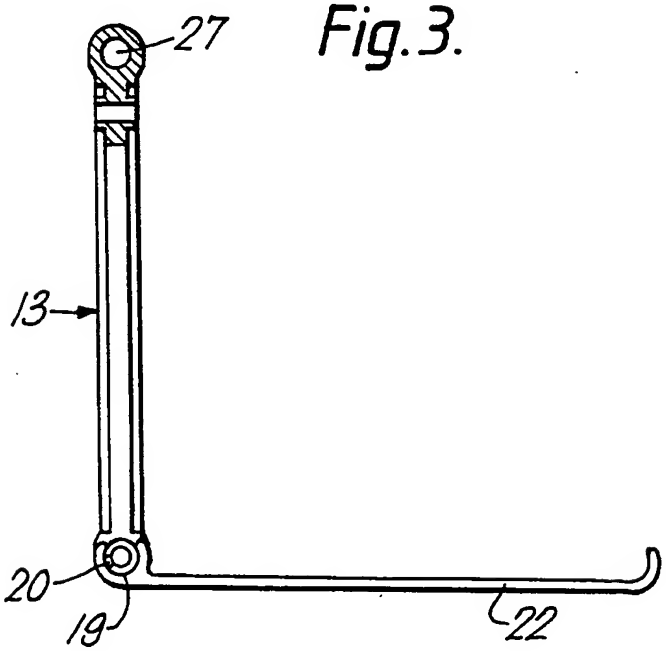


Fig.3.



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 90/00857

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [5]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: G 02 B 6/44

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	G 02 B 6/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	GB, A, 2176907 (G.E.C. PLC) 7 January 1987 see figure 1; page 1, lines 49-65; claims	1,2,4,6,7
A	EP, A, 0281196 (PHILIPS) 7 Sepember 1988 see figures 2,4; column 6, lines 33-46	1,4
A	EP, A, 0216073 (WALTER ROSE GmbH & CO. K.G.) 1 April 1987 see figures 1,2; column 3, lines 18-58	1,4,5,6

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
3rd September 1990	27 SEP 1990
International Searching Authority	**Signature of Authorized Officer**
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	DE, A, 3413401 (PHILIPS) 17 October 1985 see figure 1; claims	1,2,4
A	EP, A, 0178179 (RELIANCE ELECTRIC CO.) 16 April 1986 see figures 2,4; claims	1,4
A	EP, A, 0215668 (ADC TELECOMMUNICATIONS, INC.) 25 March 1987 see figures 2,18,19; page 5, lines 4-22; page 14, lines 12-29; claims	1,4,6

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9000857 SA 37310

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		JP-A-	63291008	28-11-88
		US-A-	4886336	12-12-89
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